

PATENT

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**UNITED STATES PATENT APPLICATION**

**OF**

**FUNG-JOU CHEN**

**JULIE BEDNARZ**

**AND**

**JEFFREY D. LINDSAY**

**FOR**

**MOP WITH DISPOSABLE WIPE AND SQUEEGEE BLADE**

**TITLE OF THE INVENTION**  
**MOP WITH DISPOSABLE WIPE AND SQUEEGEE BLADE**

**BACKGROUND**

Cleaning tools, such as mops, are commonly used in order to clean surfaces and other objects found in industry and in residential settings. Mops typically include an elongated handle and a mop head attached to the handle. A disposable wipe may be attached to the mop head, and may be configured in order 5 to pick up dirt, lint, fluid, and other material from a surface when the mop head is moved over the surface.

A disposable wipe may be configured in order to pick up these materials when the disposable wipe is dry. Alternatively, the disposable wipe may be configured as a wet wipe in order to pick up these materials when the disposable 10 wipe is moist to some degree. The disposable wipe may be packaged in a moistened state, and applied to the mop head in this same condition in order to eliminate the need to wet the disposable wipe in proportion for use. Alternatively, the wet wipe may be packaged in a dry state, attached to the mop head by the user, and then moisture may be applied by the user in order to prepare the 15 disposable wipe for use. Alternatively or additionally, the user may first wet the surface to be mopped before mopping with the wipe.

Once the disposable wipe reaches the end of its design life, the user may remove the disposable wipe from the mop head and subsequently throw away the disposable wipe. At such time, a new disposable wipe may be applied to the mop 20 head in order to resume or start cleaning.

In order to apply the disposable wipe onto the mop head, the disposable wipe is typically laid flat on a surface. The mop head is then positioned in the center of the disposable wipe. Next, the user will fold the disposable wipe around opposite ends of the mop head such that the disposable wipe covers the top of the 25 mop head on opposite ends. At this point, grippers which are located on the top of the mop head are used in order to affix the disposable wipe onto the top of the mop head. The disposable wipe is therefore positioned on the bottom of the mop head, the top of the mop head on one side of the handle, and on the top of the mop head on the other side of the handle.

It is sometimes the case that excessive fluid will be present on a surface or object that is desired to be cleaned. This excessive fluid cannot be effectively removed by the disposable wipe. In this instance, it would be desirable for a user to have a squeegee in order to effectively remove any excess fluid present. Due to  
5 the construction of mop heads with disposable wipes, a squeegee cannot be effectively incorporated therein due to the fact that the disposable wipes cover certain portions of the mop head.

The present invention provides for an improved disposable cleaning apparatus for use with a cleaning tool, and for a mop for use in cleaning a surface  
10 that incorporates both a disposable wipe and a squeegee blade therein.

### SUMMARY

Various features and advantages of the invention will be set forth in part in the following description, or may be obvious from the description.

15 The present invention provides for a disposable cleaning apparatus that may be used with a cleaning tool. The disposable cleaning apparatus includes a disposable wipe that is configured for removable attachment to the cleaning tool. The disposable wipe is configured for engaging a surface to be cleaned and for removing unwanted material from this surface. A squeegee blade is attached to  
20 the disposable wipe and is configured for removing excess fluid from the surface that is to be cleaned. In other embodiments, the squeegee blade can be attached or removed from the mop head independently of the wipe.

The squeegee blade can be positioned on the upper surface of a mop head, with a portion extending away from the mop head and/or away from the wipe, such  
25 that inversion of the mop head places the squeegee blade in contact with the floor to provide a squeegee function in moving or removing water or other fluids.

The present invention also provides for a disposable cleaning apparatus as set forth above where the squeegee blade is made from polyolefin plastic, any deformable plastic, synthetic rubber, natural rubber, other elastomers, foam  
30 materials including elastomeric or other deformable polymeric foams, and/or a polymer. In one embodiment, the squeegee blade is a foam that deforms to substantially conform to a surface being mopped. This is done in order to obtain enhanced water removal, and optionally for uptake of water into the foam itself. In

another embodiment, a deformable abrasive foam such as a layer of an open-celled melamine-based foam can be used as a squeegee, a component of the squeegee, or as a buffing strip on the mop. Such abrasive foam materials may be useful in removing marks, such as scuff marks, on flooring or other surfaces such

- 5 as walls or ceilings, and in some embodiments can also provide squeegee functionality.

Also provided in accordance with the present invention is a disposable cleaning apparatus as set forth above where the squeegee blade is attached to the disposable wipe by adhesives, ultrasonic bonding, thermal welding, and/or  
10 mechanical fasteners.

Also provided for in accordance with the present invention is a mop for use in cleaning a surface. The mop includes a mop head that has a handle attachment surface and a disposable wipe attachment surface. A handle is attached to the handle attachment surface. A disposable wipe is attached to the disposable wipe

- 15 attachment surface and is configured to be removed from the disposable wipe attachment surface by a user of the mop. The disposable wipe is configured for engaging a surface that is to be cleaned, and for removing unwanted material from this surface. A squeegee blade is attached to the mop head, and is configured for removing excess fluid from the surface that is to be cleaned. The squeegee blade  
20 and the disposable wipe are not attached to one another in this embodiment.

Also provided for in accordance with the present invention is a mop as set forth above where the squeegee blade is attached to the handle attachment surface of the mop head.

- Also provided for in accordance with the present invention is a mop as set  
25 forth above where the mop head has a leading edge and a trailing edge. The disposable wipe is attached to the leading and trailing edge of the mop head, and is configured to be removed from the leading and trailing edges by a user of the mop. The squeegee blade is attached to the handle attachment surface.

- Also provided for in accordance with the present invention is a mop as set  
30 forth above where the disposable wipe is attached to the disposable wipe attachment surface by pressure-sensitive adhesives, hook and loop fasteners, gecko-like adhesives, and/or activatable adhesives.

The present invention also provides for a mop that can be used in cleaning a surface. The mop includes a mop head that has a handle attachment surface, and a handle that is attached to the handle attachment surface. A disposable wipe is attached to the mop head. The disposable wipe is configured to be removed  
5 from the mop head by a user of the mop, and is configured for engaging the surface to be cleaned and for removing unwanted material from this surface. A squeegee blade is attached to the disposable wipe and is configured for removing excess fluid from the surface that is to be cleaned. Removal of the disposable wipe from the mop head causes the squeegee blade to also be removed from the  
10 mop head.

The present invention also provides for a mop as set forth above where the disposable wipe is attached to the handle attachment surface, and where the squeegee blade is also located on the handle attachment surface.

Also provided for in accordance with the present invention is a mop as set  
15 forth above where an end of the disposable wipe is attached to the handle attachment surface of the mop head, and is wrapped around a portion of the mop head so that the opposite end of the disposable wipe is also attached to the handle attachment surface. The squeegee blade is attached to one of the ends of the disposable wipe so that the squeegee blade is located on the handle attachment  
20 surface of the mop head.

The present invention also provides for a mop as discussed above where the handle is pivotally attached to the handle attachment surface of the mop head.

Additionally, the present invention provides for exemplary embodiments where the disposable wipe may be a wet wipe that cleans the surface to be  
25 cleaned with the use of a fluid wetting the wipe. Alternatively, the disposable wipe may be a dry wipe that is configured to clean the surface that is to be cleaned without the use of a fluid wetting the wipe.

#### BRIEF DESCRIPTION OF THE DRAWINGS

30 Figure 1 is a perspective view of an exemplary embodiment of a mop in accordance with the present invention. A squeegee blade is shown attached to the disposable wipe.

Figure 2 is a partial side view of the exemplary embodiment of the mop shown in Figure 1.

Figure 3 is a side view of the pivotable handle attachment shown in Figure 1.

5       Figure 4 is a perspective view of a mop in accordance with another exemplary embodiment of the present invention. A squeegee blade is attached to the top of the mop head.

Figure 5 is a partial side view of the exemplary embodiment of the mop shown in Figure 4.

10      Figure 6 is a cross-sectional view of the pivotable handle attachment shown in Figure 4.

Figure 7 is a perspective view of a disposable cleaning apparatus in accordance with one exemplary embodiment of the present invention. The disposable cleaning apparatus includes a disposable wipe and a squeegee blade.

15      Figure 8 is a side view of a stack of disposable cleaning apparatuses.

Figure 9 is a perspective view of an exemplary embodiment of a squeegee blade in accordance with the present invention. The ends of the tip of the squeegee blade are curved in towards one another.

20      Figure 10 is a perspective view of a disposable cleaning apparatus in accordance with one exemplary embodiment of the present invention. The squeegee blade included in the disposable cleaning apparatus has a plurality of ribbed features located thereon.

#### DETAILED DESCRIPTION

25      Reference will now be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, and not meant as a limitation of the invention. For example, features illustrated or described as part of one embodiment can be used with another embodiment to yield still a third embodiment. It is intended that the present invention include these and other modifications and variations.

The present invention is not limited to the numerical ranges and limits discussed herein. For example, a range of from about 100 to about 200 also

includes ranges from about 110 to about 190, about 140 to about 160, and from 31 to 45. As a further example, a numerical limit of less than about 10 also includes a numerical limit of from less than about 7, less than about 5, and less than 3.

The present invention provides for a mop and a disposable cleaning apparatus that incorporate both a disposable wipe and squeegee blade. Such a combination allows for a device that is capable of both cleaning a surface, and also removing excess fluid therefrom. In some embodiments, the squeegee blade may be effective for other cleaning functions such as abrasive removal of dirt, deposits, or scuff marks, as set forth hereafter.

Figure 1 is a perspective view of a mop 12 used in accordance with one exemplary embodiment of the present invention. The mop 12 may be used in order to clean any type of surface, for instance the mop 12 may be used to clean floors, walls, ceilings, and/or objects such as cabinets, desks, and vehicles.

The mop 12 includes a handle 32 that is elongated and has a grip 34 located on one end to provide an area for a user of the mop 12 to hold and move the handle 32. The mop 12 may also be provided with an additional grip or grips (not shown) at various locations along the length of the handle 32 with which the user may further grasp the mop 12. Alternatively, the mop 12 may be configured so that it does not have any hand grips 34 present thereon. In these instances, the user may simply grasp the handle 32 in order to manipulate the mop 12.

The handle 32 is pivotably connected to a mop head 70. The pivotable connection between the mop head 70 and the handle 32 is affected by a pivotable handle attachment 48. The pivotable handle attachment 48 is shown in greater detail in Figure 3. The pivotable handle attachment 48 is configured as a universal joint, allowing the handle 32 to be pivoted both forwards and backwards with respect to the mop head 70, and also left and right with respect to the mop head 70.

The pivotable handle attachment 48 includes a clevis 50 that is rigidly attached to the mop head 70. Attachment of the clevis 50 to the mop head 70 may be affected in any manner commonly known to those skilled in the art. For instance, the clevis 50 may be welded onto the mop head 70, attached to the mop head 70 with mechanical fasteners, or may be formed as a single integral piece with the mop head 70.

A swivel 54 is disposed within the clevis 50 and is held in pivotable engagement with the clevis 50 by a pin 52. The swivel 54 is therefore configured in order to allow the handle 32 to pivot in a back and forth motion with respect to the mop head 70. A sleeve 56 is also included in the pivotable handle attachment

5 48. The sleeve 56 is in pivotable engagement with the swivel 54, and a pin 58 is used to place the sleeve 56 into pivotable engagement with the swivel 54 such that the sleeve 56 rotates in a direction that is 90 degrees from the direction in which the swivel 54 rotates. The sleeve 56 and pin 58 therefore allow the handle 32 to rotate in a left to right direction with respect to the mop head 70.

10 The sleeve 56 is configured in order to be both pivotably attached to the swivel 54 on one end, and rigidly attached to the handle 32 on an opposite end. The handle 32 may be attached to the sleeve 56 through a threaded connection, or through any other connection commonly known to those skilled in the art for instance mechanical fasteners, welding, or adhesion may be employed.

15 Alternatively, the handle 32 may be integrally formed with the sleeve 56.

In accordance with other exemplary embodiments of the present invention, the pivotable handle attachment 48 may be configured differently than disclosed in Figures 1-3. For instance, the pivotable handle attachment 48 may be configured in a manner similar to the universal joint disclosed in U.S. Patent No. 4,852,210, 20 the entire disclosure of which is incorporated by reference in its entirety into the present application for all purposes. Alternatively, the pivotable handle attachment 48 may be configured in order to only allow the handle 32 to pivot in one direction with respect to the mop head 70. Additionally, the mop 12 may be configured so that it does not incorporate a pivotable handle attachment 48. In this instance, the 25 handle 32 may be rigidly attached to the mop head 70, and therefore the two components are not rotatable with respect to one another.

Figure 2 shows a detailed side view of the mop 12 of Figure 1. Here, the clevis 50 of the pivotable handle attachment 48 is rigidly attached to a handle attachment surface 36. The handle attachment surface 36 is located on the side of 30 the mop head 70 which is generally opposite from the side of the mop head 70 which faces the surface that is to be cleaned. A disposable wipe 14 is attached to the mop head 70. In the exemplary embodiment shown in Figures 1-3, the ends 26, 28 of the disposable wipe 14 are attached to the handle attachment surface 36

by adhesive attachments 66, 68. However, various mechanisms may be employed in order to connect the disposable wipe 14 to the mop head 70. For instance, instead of using the adhesive attachments 66, 68 the disposable wipe 14 may be attached to the mop head 70 by the use of a mechanical attachment, for 5 instance bolts, pins, gripping elements, frictional elements, or any other type of mechanical fastener may be employed. For example, a spring-loaded rod or bar may be configured as a clamp (not shown) to hold the wipe 14 in place or to secure the squeegee blade 16. The squeegee blade 16 or a rigid backing plate (not shown) attached to the squeegee blade 16 may also have protrusions that 10 extend into retention holes or other receptacles on the mop head 70 to firmly engage the protrusions and hold the squeegee blade 16 in place. When a backing plate (not shown) is joined to the squeegee blade 16, the wipe 14 may be directly attached to the backing plate, the squeegee blade 14, or neither (e.g., the squeegee blade 16 and the backing plate may be separately attachable to the mop 15 head 70 independent of the presence of the wipe 14). Hook and loop systems may also be used to join the squeegee blade 16 to the wipe 14 or to the mop head 70 or other elements. Alternatively, a mechanical attachment may be used in order to connect the end 26 to the handle attachment surface 36, while an adhesive attachment is used to connect the other end 28 to the handle attachment surface 20 36.

The mop 12 may also be configured such that only one of the ends 26, 28 of the disposable wipe 14 is attached to the mop head 70. Still further, the mop 12 may be configured such that a different portion of the disposable wipe 14 is attached to the mop head 70, thus allowing the ends 26, 28 of the disposable wipe 25 14 to not be attached to the mop head 70. For instance, the intermediate portion of the disposable wipe 14 may be attached to the mop head 70 at a location on the mop head 70 generally opposite from the handle attachment surface 36. It is to be understood that the present invention includes various exemplary embodiments of the mop 12 where the disposable wipe 14 is removably attached to the mop head 30 70 by different attachment mechanisms, and at different locations on the mop head 70.

As stated, the exemplary embodiment of the mop 12 shown in Figures 1-3 employs a pair of adhesive attachments 66, 68 that retain the disposable wipe 14

onto the mop head 70 during use of the mop 12. In order to remove or pick up unwanted materials from surfaces, the user will manipulate the mop 12 such that the mop head 70 is moved across the surface to be cleaned and the disposable wipe 14 engages the surface and either picks up or removes the unwanted

5 material. After removing or picking up a certain amount of unwanted material, the disposable wipe 14 will reach the end of its useful life and will no longer be able to pick up or remove material, or will not be able to pick up or remove this material at a desired rate. At this point, the user of the mop 12 will remove the disposable wipe 14 from the mop head 70. For instance, the user may grasp the disposable  
10 wipe 14 and pull the disposable wipe 14 from the mop head 70 such that the holding force of the adhesive attachments 66, 68 are overcome and the disposable wipe 14 is separated from the mop head 70. In accordance with other exemplary embodiments of the present invention, should the disposable wipe 14 be attached to the mop head 70 by a mechanical attachment such as bolts, pins, or gripper  
15 elements, these mechanical attachments may be disengaged in order to allow for the disposable wipe 14 to be removed from the mop head 70. For instance, pins holding the disposable wipe 14 may be removed by the user in order to cause disengagement. Gripping elements such as those used to engage a wipe 14 on known mop heads 70 such as SWIFFER® mops may be used.

20 Once the used disposable wipe 14 has been removed from the mop head 70, a new disposable wipe 14 may be attached to the mop head 70 in order to start or resume cleaning of the surface by the mop 12. In this instance, the new disposable wipe 14 may be attached to the mop head 70 in a manner similar to the prior attachment of the used disposable wipe 14 to the mop head 70.

25 The adhesive attachments 66, 68 may be configured such that adhesion is located on the ends 26, 28 of the disposable wipe 14 and is pressed onto the handle attachment surface 36 of the mop head 70 in order to retain the disposable wipe 14 on the mop head 70. Alternatively, the adhesive attachments 66, 68 may be configured such that adhesion is present on the handle attachment surface 36  
30 of the mop head 70, and the ends 26, 28 of the disposable wipe 14 are pressed thereon and engaged. Still further exemplary embodiments of the present invention exist where the adhesive attachments 66, 68 include adhesion on both

the handle attachment surface 36 of the mop head 70, and on the ends 26, 28 of the disposable wipe 14.

The mop 12 includes a squeegee blade 16 that is attached to the disposable wipe 14. The squeegee blade 16 may be used in order to remove excess fluid that has accumulated onto the surface which is to be cleaned by the mop 12. In this instance, the squeegee blade 16 may remove the excess fluid from the surface, allowing for the disposable wipe 14 to further clean the surface. The squeegee blade 16 may be attached to the disposable wipe 14 in any manner commonly known to those skilled in the art. For instance, the squeegee blade 16 may be attached through ultrasonic bonds, thermal welds, mechanical fasteners, and/or adhesives such as hot melts and isocyanates. The squeegee blade 16 may be made out of a material that is rigid enough to allow the squeegee blade 16 to function, yet flexible and soft enough to prevent the squeegee blade 16 from scratching the surface which is to be cleaned. In accordance with certain exemplary embodiments of the present invention, the squeegee blade 16 may be made from a polyolefin plastic, any deformable plastic, synthetic rubber, natural rubber, an elastomer, foam materials including elastomeric or other deformable polymeric foams, and the like. Additionally, the squeegee blade 16 may be made from a material that is either natural or synthetic. The squeegee blade 16 may be mounted on any portion of the mop head 70, for instance the squeegee blade 16 may be attached to the front, back, top, bottom, or side of the mop head 70.

The squeegee blade 16 shown in the exemplary embodiment in Figures 1-3 is a blade that is essentially straight from one side to the other. However, in accordance with other exemplary embodiments of the present invention, the squeegee blade 16 may be variously designed. For instance, the squeegee blade 16 may be curved, fluted, ribbed, and/or cross-hatched. Additionally, the surface of the squeegee blade 16 may be either smooth or textured. Figure 9 shows an alternative exemplary embodiment of the present invention in which the squeegee blade 16 has a tip 30 that is curved. The tip 30 has a curved end 18 on one side, and a curved end 20 on an opposite side. The curved ends 18, 20 are curved towards one another and define a curved cavity 22. The curved squeegee blade 16 shown in Figure 9 may be advantageous in certain exemplary embodiments of the present invention in that fluid may be more easily transferred across the

surface to be cleaned by being retained in and pushed by the curved cavity 22 of the tip 30. Additionally, the curved ends 18, 20 of the tip 30 may prevent fluid from being pushed around the sides of the squeegee blade 16 and hence contacting and saturating the disposable wipe 14.

5       The squeegee blade 16 may be made out of either a flexible or rigid material. Further, the squeegee blade 16 may be either elastomeric or non-elastomeric. In accordance with one exemplary embodiment of the present invention, the squeegee blade 16 has a length from about 0.5 inches to about 4 inches. Additionally, in accordance with one exemplary embodiment of the present  
10 invention the squeegee blade 16 has a maximum thickness of about 5 mm. Still further, an alternative exemplary embodiment of the present invention exists in which the squeegee blade 16 has a maximum thickness of about 3 mm.

The exemplary embodiment shown in Figures 1-3 therefore allows for the mop 12 to have the disposable wipe 14 wrap around the mop head 70 and still  
15 provide for an attachment of the squeegee blade 16. Although shown as being attached to the end 26, the squeegee blade 16 may be attached to any portion of the disposable wipe 14 in accordance with other exemplary embodiments of the present invention. Additionally, a second squeegee blade 16 may be employed, and may be attached, for instance, to the other end 28 of the disposable wipe 14.

20       Another exemplary embodiment of the mop 12 is shown in Figures 4-6. In this exemplary embodiment of the present invention, the mop 12 is provided with a pivotable handle attachment 48 which is a ball and socket type attachment. A ball 62 is located at the end of the handle 32. A socket cap 64 is retained in the mop head 70 by any means commonly known in the art. The ball 62 is retained within  
25 the socket cap 64 and may rotate therein. As such, the handle 32 of the mop 12 may be rotated either forward or backward, left or right, or diagonally with respect to the mop head 70.

The ball 62 may be retained within the socket cap 64 via a frictional fit which allows for the user of the mop 12 to rotate the ball 62 within the socket cap 64 by  
30 moving the handle 32. However, the frictional fit is strong enough to prevent the handle 32 from moving on its own once the user of the mop 12 lets go of the handle 32. As previously mentioned, the present invention may employ any type of pivotable handle attachment 48 in accordance with various exemplary

embodiments of the present invention. The configuration of the pivotable handle attachment 48 shown in Figures 4-6 is only one type of pivotable handle attachment 48 which may be employed, and it is to be understood that the present invention is not limited to the pivotable handle attachment 48 shown, but may be of  
5 any type.

The handle 32 is pivotably attached to the handle attachment surface 36 of the mop head 70 by the pivotable handle attachment 48. A disposable wipe attachment surface 38 is present on the mop head 70, and a majority of the disposable wipe attachment surface 38 is opposite from the handle attachment surface 36. The disposable wipe 14 is removably attached to the disposable wipe attachment surface 38. In this regard, an adhesive attachment 42 is employed in order to retain the disposable wipe 14 onto the disposable wipe attachment surface 38. As previously mentioned with respect to other exemplary embodiments, the disposable wipe 14 may be attached to the mop head 70 by  
10 other mechanisms, and is not limited to simply being an adhesive attachment. For instance, the disposable wipe 14 may be attached to the disposable wipe attachment surface 38 by use of mechanical fasteners such as bolts, pins, rivets,  
15 or gripper elements.

In the exemplary embodiment shown in Figures 4-6, the adhesive attachment 42 retains the disposable wipe 14 onto the disposable wipe attachment surface 38 with a sufficient amount of force such that the disposable wipe 14 is not disengaged from the mop head 70 during normal use of the mop 12. Once the disposable wipe 14 reaches the end of its useful life, a user may grasp the disposable wipe 14 and disengage the disposable wipe 14 from the disposable  
20 wipe attachment surface 38, therefore breaking or disengaging the adhesive attachment 42. At such time, a new disposable wipe 14 may be affixed to the disposable wipe attachment surface 38 in order to start or resume cleaning with the mop 12.

In the exemplary embodiment shown in Figures 4-6, the squeegee blade 16  
25 is not attached to the disposable wipe 14. Instead, the squeegee blade 16 is attached to the handle attachment surface 36 of the mop head 70 by an adhesive attachment 40. The squeegee blade 16 may be attached to the mop head 70 by any mechanism commonly known in the art. For instance, the squeegee blade 16

may be attached through the use of adhesives, mechanical fasteners, sonic welding, or may be integrally formed therewith. As can be seen in Figure 5, the squeegee blade 16 is attached to the handle attachment surface 36 at a location proximate to a leading edge 44 of the mop head 70. In accordance with other 5 exemplary embodiments of the present invention, the squeegee blade 16 may be attached to the handle attachment surface 36 at a location proximate to a trailing edge 46 of the mop head 70. Still further, a pair of squeegee blade 16 may be employed in accordance with other exemplary embodiments of the present invention. In such an instance, one of the squeegee blades 16 may be located 10 proximate to the leading edge 44, and the other of the squeegee blades 16 may be located proximate to the trailing edge 46.

The leading edge 44 is the leading portion of the mop head 70, while the trailing edge 46 is the trailing portion of the mop head 70 opposite from the leading edge 44. Some users of the mop 12 may move the mop head 70 in a forward and 15 backward motion along the surface to be cleaned, a motion generally in line with the leading edge 44 and trailing edge 46.

Although described as being attached to the handle attachment surface 36, the squeegee blade 16 may be attached to any portion of the mop head 70 in accordance with other exemplary embodiments of the present invention. For 20 instance, the squeegee blade 16 may be attached to the side of the mop head 70, or may be attached to the disposable wipe attachment surface 38 in accordance with other exemplary embodiments. The squeegee blade 16 may be either permanently attached to the mop head 70, or may be temporarily attached to the mop head 70 such that the user may disengage the squeegee blade 16 from the 25 mop head 70. The attachment of the squeegee blade 16 to the mop head 70 allows for a user of the mop 12 to use both the squeegee blade 16 and the disposable wipe 14 without having the squeegee blade 16 interfere with the operation of the disposable wipe 14.

The exemplary embodiment shown in Figures 4-6 is advantageous in that 30 the disposable wipe 14 does not wrap around the leading and trailing edges 44, 46 and contact the handle attachment surface 36. Elimination of this wrapping around allows for the squeegee blade 16 to be attached to the handle attachment surface

36, and also eliminates a portion of the disposable wipe 14 which may be wasted upon wrapping the disposable wipe 14 around the mop head 70.

The present invention also provides for a disposable cleaning apparatus 10, one exemplary embodiment of which is shown in Figure 7. The disposable 5 cleaning apparatus 10 may be attached to a mop 12 as discussed with respect to other exemplary embodiments. The disposable cleaning apparatus 10 includes a disposable wipe 14 that is attached to a squeegee blade 16. The components of the disposable cleaning apparatus 10 may be configured in the same manner as discussed with respect to the disposable wipe 14 and squeegee blade 16 of other 10 exemplary embodiments of the present invention. A stack 72 of disposable cleaning apparatuses 10 may be provided as shown in Figure 8. In this instance, the stack 72 may be sold to a user of the mop 12, and may be placed into a package such that the user may remove a single disposable cleaning apparatus 10 when replacement on the mop 12 becomes necessary. Should the disposable 15 wipe 14 be configured as a wet wipe, the stack 72 may be contained within a package that keeps the disposable cleaning apparatuses 10 damp. Alternatively, the stack 72 may be placed inside of a dry package should the disposable wipe 14 be configured for operating as a dry wipe, or should it be desirable that the disposable wipe 14 operate as a wet wipe by being wetted by a user of the mop 20 12.

Fig. 7 shows the disposable cleaning apparatus 10 with a melamine based foam 76 located on the squeegee blade 16. The melamine based foam 76 may be used as a cleaning agent in order to further remove dirt and other unwanted elements from the surface which is to be cleaned. The melamine based foam 76 25 has an open celled, microporous structure that is abrasive when rubbed across the surface to be cleaned. The melamine based foam 76 may be configured in order to work when wet. In this regard, the melamine based foam 76 may be soaked with water or wetted to some degree prior to being applied by a user to the surface to be cleaned. The melamine based foam 76 is abrasive in that when rubbed 30 across the surface, particles of the melamine based foam 76 may break off due to abrasive contact when removing dirt and other unwanted elements. Over time, the melamine based foam 76 will be worn down due to repeated abrasion with the surface. At such time, the disposable cleaning apparatus 10 may be removed and

replaced with a new disposable cleaning apparatus 10. The melamine-based foam may have a thickness of about 8 mm or less, about 5 mm or less, about 3 mm or less, or about 2 mm or less.

The melamine based foam 76 may be provided on only a portion of the squeegee blade 16, or may be provide across the entire surface of the squeegee blade 16, including the tip 30 in various exemplary embodiments. The melamine based foam 76 may also be incorporated into the squeegee blade 16 which is on the disposable wipe 14 attached to the mop 12. In accordance with other exemplary embodiments of the present invention, the entire squeeze blade 16 on either the mop 12 or the disposable cleaning apparatus 10 may be made entirely of melamine based foam 76 or comprise one or more discrete elements made at least in part from melamine-based foam.

Principles for manufacturing melamine-based foam are well known. Melamine-based foams are currently manufactured by BASF (Ludwigshafen, Germany) under the BASOTECT® brand name. For example, BASOTECT® 2011, with a density of about 0.01 g/cm<sup>3</sup>, may be used. Blocks of melamine-based foam for cleaning are marketed by Procter & Gamble (Cincinnati, Ohio) under the MR. CLEAN® brand name, and under the CLEENPRO™ name by LEC, Inc. of Tokyo, Japan. Melamine-based foam is also marketed for acoustic and thermal insulation by many companies such as American Micro Industries (Chambersburg, Pennsylvania). The foam may be heat treated and compressed to increase its density.

Principles for production of melamine-based foam are disclosed by H. Mahnke et al. in EP-B 071 671, published Dec. 17, 1979. According to EP-B 017 25 671, they are produced by foaming an aqueous solution or dispersion of a melamine-formaldehyde condensation product which comprises an emulsifier (e.g., metal alkyl sulfonates and metal alkylaryl sulfonates such as sodium dodecylbenzene sulfonate), an acidic curing agent, and a blowing agent, such as a C5 -C7 hydrocarbon, and curing the melamine-formaldehyde condensate at an 30 elevated temperature. The foams are reported to have the following range of properties:

- a density according to DIN 53 420 between 4 and 80 grams per liter (g/l), corresponding to a range of 0.004 g/cc to 0.08 g/cc;

- a thermal conductivity according to DIN 52 612 smaller than 0.06 W/m °K;
- a compression hardness according to DIN 53 577 under 60% penetration, divided by the density, yielding a quotient less than 0.3 (N/cm<sup>2</sup>)/(g/l), and preferably less than 0.2 (N/cm<sup>2</sup>)/(g/l), whereby after measurement of compression hardness the thickness of the foam recovers to at least 70% and preferably at least 90% of its original thickness;
- an elasticity modulus according to DIN 53 423, divided by the density of the foam, under 0.25 (N/mm<sup>2</sup>)/(g/l) and preferably under 0.15 (N/mm<sup>2</sup>)/(g/l);
- a bending path at rupture according to DIN 53 423 greater than 6 mm and preferably greater than 12 mm;
- a tensile strength according to DIN 53 571 of at least 0.07 N/mm<sup>2</sup> or preferably at least 0.1 N/mm<sup>2</sup>; and
- by German Standard Specification DIN 4102 they show at least standard flammability resistance and preferably show low flammability.

US Pat. No. 4,666,948, "Preparation of Resilient Melamine Foams," issued

20 May. 19, 1987 to Woerner et al., discloses other melamine-based foams that may be used in the present invention. US Pat. No. 6,503,615, issued Jan. 7, 2003 to Horii et al., discloses a wiping cleaner made from an open-celled foam such as a melamine-based foam, the wiping cleaner having a density of 5 to 50 kg/m<sup>3</sup> in accordance with JIS K 6401, a tensile strength of 0.6 to 1.6 kg/cm<sup>2</sup> in accordance 25 with JIS K 6301, an elongation at break of 8 to 20% in accordance with JIS K 6301 and a cell number of 80 to 300 cells/25 mm as measured in accordance with JIS K 6402. Melamine-based foams having such mechanical properties can be used within the scope of the present invention.

Related foams are disclosed in US Pat. No. 3,093,600 with agents present 30 to improve the elasticity and tear strength of the foam. Melamine-based foams are also disclosed in British patent GB 1443024, issued July 21, 1976. The entire disclosure of United States Patent Number 6,608,118, issued August 19, 2003 to Kosaka, et al. is incorporated by reference herein in its entirety.

The melamine-based foam may be provided as a thin, flexible layer joined to a reinforcing web of tissue, nonwoven material, fabric, or other materials, including those disclosed in commonly owned copending application, Ser. No. unknown, "Multi Purpose Cleaning Product Including a Foam and a Web" by Chen et al., filed on December 22, 2003, the same day as the present document.

An alternative exemplary embodiment of the disposable cleaning apparatus 10 is shown in Figure 10. Here, the squeegee blade 16 has a plurality of ribbed features 24 located thereon. The ribbed features 24 may assist in the removal of fluid from the surface to be cleaned by providing for a channel between the ribbed features 24 which allows for the transport of fluid by the squeegee blade 16. The ribbed features 24 define a plurality of cavities 74. The disposable wipe 14 may be retained through adhesion to the surface of the squeegee blade 16 proximate to the cavities 74. Alternatively, the disposable wipe 14 may be attached across the surface of the squeegee blade 16 from one end to the other. As such, the squeegee blade 16 used in either the disposable cleaning apparatus 10 or the mop 12 may be made in various shapes and configurations in accordance with various exemplary embodiments of the present invention.

The user of the mop 12 may move the handle 32 such that the mop head 70 is inverted, allowing for the squeegee blade 16 to contact the surface to be cleaned and remove excess fluid therefrom. For instance, a user may turn the mop head 70 upside down in order to reposition the squeegee blade 16 such that it contacts the surface to be cleaned. In this instance and in other related cases, a portion of the squeegee blade 16 after inversion can be directly below the mop head 70 such that the mop head 70 applies leverage on the squeegee blade 16 to force the tip 30 of the squeegee blade 70 to press downward against the surface to be cleaned for effective contact. Alternatively, the squeegee blade 16 may be configured such that it extends to the surface to be cleaned while the mop head 70 is in the positions shown in Figures 2 and 5. In this instance, the user of the mop 12 may move the handle 32 such that the mop head 70 is repositioned and the squeegee blade 16 does not contact the surface to be cleaned. At such time, the user may move the mop head 70 across the surface to be cleaned in order for unwanted materials to be picked up or removed by the disposable wipe 14.

Alternatively, the mop 12 may be configured such that both the squeegee blade 16 and the disposable wipe 14 simultaneously engage the surface to be cleaned.

As mentioned, the squeegee blade 16 and/or the disposable wipe 14 may be attached to the mop head 70 and/or one another through several different mechanisms. For instance, the attachment may be through pressure-sensitive adhesives, hook and loop type fasteners, gecko-like fasteners, and/or activatable adhesives. Gecko-like adhesives are discussed by Kelly Autumn et al., "Evidence for van der Waals Adhesion in Gecko Setae," *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 99, No. 19, pp. 12,252 - 12,256 (Sept. 17, 2002), and by Robert J. Full et al., "Adhesive Microstructure and Method of Forming the Same," WO 01/49776, published July 12, 2001. Both of the aforementioned publications are incorporated by reference herein in their entireties.

The mop 12 and/or disposable cleaning apparatus 10 may be used to clean any type of surface. For instance, the mop 12 and disposable cleaning apparatus 10 may be used in order to clean windows, cars, and porcelain surfaces such as showers or toilets. Further, the disposable cleaning apparatus 10 may be used in order to clean dishes, used as a skin-cleansing tool, and used as a covering on a scrubby pad or sponge. As such, the mop 12 and/or disposable cleaning apparatus 10 may be used in a variety of applications in order to clean a variety of surfaces.

The disposable wipe 14 may be configured in order to have a variety of properties. For instance, the disposable wipe 14 may be an electrostatically treated web in accordance with one exemplary embodiment of the present invention. The disposable wipe 14 may be a dry wipe or a wet wipe. Further, the disposable wipe 14 may be made of a high wet strength tissue web, or may be made from laminates of non-woven webs and tissue webs. The disposable wipe 14 may be elastomeric wipe that is stretchable or extendable, or may alternatively be a non-stretchable wipe. The disposable wipe 14 may also include encapsulated cleaning agents or anti-microbial agents. Additionally, the disposable wipe 14 may be configured in order to contain an aroma agent that will deliver a particular scent to the surface to be cleaned.

Further, the mop head 70 itself may be adapted in order to deliver an agent or active ingredient for enhancing the cleaning of the surface, removing odors from the surface, adding a scent to the surface, adding an anti-microbial agent to the surface, or providing some type of surface treatment to the surface to be cleaned.

- 5 The surface treatment applied to the surface to be cleaned may be a wax, a polish, buffering agents, buffering agents, an oil removal agent, an acidic or basic ingredient, a grout cleaning agent, a ceramic or tile cleaning agent, an anti-mildew agent, and/or bleach. The agent delivered by the mop head 70 may be a dry material such as a powder, for instance baking soda, abrasive grit, miticide, or a
- 10 zeolite. Further, the agent delivered by the mop head 70 may be a wet agent such as a surfactant, a perfumed solution, a solution of cyclodextrin or other odor absorbing agent, an anti-microbial agent, a preservative agent, an oil or polish, water, a window cleaner, and/or an indicator solution that indicates the presence of bacteria or other harmful agents. Additionally, the agent delivered by the mop
- 15 head may be a gaseous agent such as an aroma, a volatile compound, and/or an anti-microbial gas. In accordance with one exemplary embodiment of the present invention, the mop head 70 may deliver a nanoemulsion to the surface that is to be cleaned.

Although discussed as being delivered by the mop head 70, it is to be understood that the present invention includes various exemplary embodiments where the aforementioned types of agents or active ingredients that were discussed as being delivered by the mop head 70 may also be configured in order to be delivered by the disposable wipe 14. Further, the aforementioned agents or active ingredients may be delivered by a combination of both the mop head 70 and the disposable wipe 14 in accordance with other exemplary embodiments of the present invention.

Further exemplary embodiments of the present invention are described below as Examples 1-4:

30 **Example 1: Squeegee blade attached to a wet disposable wipe**

The mop 12 may be configured to use a disposable wipe 14 that is a SWIFFER™ wet wipe (SWIFFER® Wet Cloths) made by the Procter & Gamble Company located at 1 or 2, Procter & Gamble Plaza Cincinnati, OH 45201. The

wipe measures about 25 cm X 21 cm. The wipe 14 was dried at room temperature. A 3.2-centimeter by 23-centimeter strip of 2-millimeter thick foam (Darice Foamies, Item #1144-22, UPC 082676159909, Darice Inc., Strongsville, Ohio.) was attached to the dried wipe using 25.4-millimeter wide two-sided tape (23 cm long). The tape  
5 was placed along a front edge of the foam strip, leaving a nearly 7-millimeter width of the foam unattached to the cloth. The foam strip was located with a first edge proximate to a first edge of the cloth, and the second edge being remote from the edge of the cloth, with the second edge being proximate to the unattached region of the foam strip (i.e., the unattached edge of the foam strip was remote from the  
10 first edge of the cloth). The direction traversed by the first edge of the cloth corresponded to the major axis of the cloth, which is intended to be aligned with the cross-direction of the mop. The first edge of the foam strip as attached was about 2.9 cm from the first edge of the cloth and centered with respect to the 25-cm width of the cloth, with the unattached portion of the foam extending toward the  
15 interior of the sheet. The floor contacting area of the cloth, when mounted on the mop head, is about 9.5 cm by 25 cm. The cloth with the foam strip was then attached to the mop head by pressing the cloth into four gripping sections of the mop head, with the foam strip on the top portion of the mop head, oriented toward the front, with the unattached section of the foam extending forward from the body  
20 of the mop head and away from the cloth to form a flexible squeegee blade 16.

**Example 2: Squeegee blade attached to a dry disposable wipe**

The mop 12 is constructed exactly like Example 1 above; except for the replacement of the wet disposable wipe 14 with a dry disposable wipe 14. The dry  
25 disposable wipe 14 used is a SWIFFER™ dry wipe made by the Procter & Gamble Company located at 1 or 2, Procter & Gamble Plaza Cincinnati, OH 45201. The dry disposable wipe 14 measures about 22 cm by 28 cm. The first edge of the foam squeegee blade 16 was mounted about 3.2 cm from the first edge of the dry wipe 14.

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**Example 3: Squeegee blade attached with hook and loop fastener**

The mop 12 employs a hook and loop type fastener made by Hobby Shop Hook & Loop Fastener Set, UPC number 1402700039107091, and distributed by

Tool & Supply of New England Inc., Wilmington, DE 19899; V #267240; Item #76546. The hook fastener of the hook and loop type fastener measures 0.625 inches X 9 inches, and has a self-adhesive attachment.

The disposable wipe 14 is either a wet wipe or a dry wipe as discussed  
5 above in Examples 1 and 2. The squeegee blade 16 is a foam as discussed in Example 1 and measures 1.9 cm by 23 cm. The squeegee blade 16 is attached along one edge to the self-adhesive attachment of the hook fastener, leaving approximately 0.3 cm of the squeegee blade 16 exposed for contact with the floor. The disposable wipe 14 is attached to the mop head 17, and the squeegee blade  
10 16 is installed on top of and along the leading edge 44 of the mop head 70. The squeegee blade 16 protrudes slightly from the mop head 70. Due to the hook and loop type fastener, the squeegee blade 16 is detachable from the mop head 70.

**Example 4: Squeegee blade attached with a plastic strip**

15 The mop 12 employs a squeegee blade 16 made of the foam described in Example 1, and a disposable wipe 14 as described in Examples 1 or 2. A strip of foam, as above, was cut to dimensions of 1.3 cm X 20 cm and attached with a strip of two-sided adhesive tape to a rigid polyethylene strip with dimensions of 4.4 cm X 20 cm, with a ledge about 7 mm wide of foam remaining unattached and  
20 extending beyond the edge of the polyethylene strip about 2 mm thick such that the foam could serve as a squeegee blade 16 that extends away from the mop head 70. The polyethylene strip had two mushroom-shaped protrusions with centers about 16.5 cm apart, suitable for engaging into the gripping regions (retention holes) of the mop head 70 to hold the strip in place on the top of the mop  
25 head. The squeegee assembly (foam joined adhesively to the polyethylene strip) can be installed on the mop head 70 after the wipe 14 is already in place, or at the same time as the wipe 14 is attached with the protrusions serving to push the sheet into the retention holes of the mop head 70. The squeegee blade 16 and/or the polyethylene strip can help to secure the disposable wipe 14 to the mop head  
30 70. The strip of adhesive tape used to join the foam to the polyethylene was about 6 mm wide and about 20 cm long. The rear edge of the plastic strip (remote from the foam) had a portion of the plastic removed to allow room for the mop handle  
32. The removed area is approximately 4.4 cm wide X 1.2 cm deep, centered on

the edge of the plastic strip. The resulting assembly comprised a foam-based squeegee blade 16 with a rigid backing plate (the polyethylene strip) mounted to the mop head 70 and in contact with the wipe 14. When the mop head 70 was inverted, the squeegee blade 16 was particularly effective in removing water.

- 5 It should be understood that the present invention includes various modifications that can be made to the exemplary embodiments of the mop 12 and/or disposable cleaning apparatus 10 as described herein as come within the scope of the appended claims and their equivalents.